

**Notice of Allowability**

Application No.

09/528,766

Examiner

Timothy P. Solak

Applicant(s)

RADUE, MARTIN L.

Art Unit

3746

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to amendment received on 02/02/2005.
2. ☒ The allowed claim(s) is/are 38-55.
3. ☐ The drawings filed on \_\_\_\_\_ are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All   b) ☐ Some\*   c) ☐ None   of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  6. ☒ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☒ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date 09/18/2001.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08),  
Paper No./Mail Date 2/2/05 ; 4/15/05 ; 4/15/05
4. ☐ Examiner's Comment Regarding Requirement for Deposit  
of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413),  
Paper No./Mail Date 20050423.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_.

## EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Dominic Goudreault on 04/28/2005.

The application has been amended as follows:

### *In the Claims:*

The attached amendment has been entered.

Claim 38 has been amended as follows:

--38. (Currently Amended) A fuel injection system for an internal combustion engine, comprising:  
    a fuel reservoir; and  
    at least one reciprocating fuel pump assembly in fluid communication with the fuel reservoir, each of the at least one reciprocating fuel pump assemblies comprising:  
        a housing assembly including a drive section and an adjacent pump section;  
        a drive assembly disposed in the drive section, the drive assembly including a permanent magnet having a first magnetic field and a coil assembly having a winding,  
        one of the magnet and the coil assembly being capable of reciprocal movement along an axis between a first position and a second position with respect to the other, the one forming, at least in part, a movable member,

a controller capable of generating a first and a second signal;

application to the winding of [a] the first signal having a first polarity and a first amplitude generating a second magnetic field interacting with the first magnetic field to control movement of the movable member between the first position and the second position,

application to the winding of [a] the second signal having a second polarity and a second amplitude generating a third magnetic field interacting with the first magnetic field to control movement of the movable member between the second position and the first position,

the first polarity being opposite to the second polarity, the first and second signals being independently alterable as a function of engine demand;

a resilient member biasing the movable member in the first position; and

a pump assembly disposed in the pump section, the pump assembly including a pump member capable of reciprocal movement, the pump member operatively connected to the movable member, movement of the movable member causing movement of the pump member.--

Claim 47 has been amended as follows:

--47. (Currently Amended) An internal combustion engine, comprising:

at least one combustion chamber; and

a fuel injection system having a reciprocating fuel pump assembly associated with the combustion chamber to inject fuel therein,

the reciprocating fuel pump assembly comprising:

a housing assembly including a drive section and an adjacent pump section;

a drive assembly disposed in the drive section, the drive assembly including a permanent magnet having a first magnetic field and a coil assembly having a winding,

one of the magnet and the coil assembly being capable of reciprocal movement along an axis between a first position and a second position with respect to the other, the one forming, at least in part, a movable member,

a controller capable of generating a first and a second signal;

application to the winding of [a] the first signal having a first polarity and a first amplitude generating a second magnetic field interacting with the first magnetic field to control movement of the movable member between the first position and the second position,

application to the winding of [a] the second signal having a second polarity and a second amplitude generating a third magnetic field interacting with the first magnetic field to control movement of the movable member between the second position and the first position,

the first polarity being opposite to the second polarity, the first and second signals being independently alterable as a function of engine demand;

a resilient member biasing the movable member in the first position; and

a pump assembly disposed in the pump section, the pump assembly including a pump member capable of reciprocal movement, the pump member operatively connected to the movable member, movement of the movable member causing movement of the pump member.--

### ***Reasons for Allowance***

The following is an examiner's statement of reasons for allowance: the prior art of record, does not teach or make obvious the apparatus of Claims 38 and 47, specifically a fuel injection assembly comprising: a pump assembly and a drive assembly; said drive assembly comprising: a permanent magnet having a first magnetic field and a coil assembly having a winding, one of the magnet and coil assembly being capable of reciprocal movement along an axis between a first position and a second position, the one forming a moveable member; a controller capable of generating a first and a second signal, wherein application to the winding of the first signal, having a first polarity and a first amplitude, generating a second magnetic field interacting with the first magnetic field to control movement of the movable member between the first position and the second position, and a resilient member biasing the movable member in

the first position; but more specifically, wherein application to the winding of the second signal, having a second polarity and a second amplitude, generates a third magnetic field interacting with the first magnetic field to control movement of the movable member between the second position and the first position; said first and second signals being independently alterable as a function of engine demand.

The closest art of record Heimberg (5,540,206) teaches a fuel injection system comprising a reciprocating pump member, a coil and a spring. Heimberg, however, does not teach or make obvious a first magnetic field generated by a permanent magnet, a first signal being sent to the coil generating a second magnetic field to interact with the first magnetic field to move the pump member from a first position to a second position and a second signal being sent to the coil generating a third magnetic field to interact with the first magnetic field to move the pump member from the second position to the first position. Heimberg, instead teaches away from this idea by disclosing the pump member "is returned into its resting position by the spring" (column 7, lines 30-31). Heimberg fails to teach or make obvious a second signal being sent to the coil generating a third magnetic field to interact with the first magnetic field to move the pump member from the second position to the first position

Gladden (3,781,140) discloses a pump comprising a coil, a permanent magnet, a reciprocating pumping member and a spring. Gladden's Figure 4, further discloses that two signals (96/96) are sent to the coil, however the two signals are not of opposite polarity. Accordingly, Gladden does not teach or make obvious a second signal being independently alterable as a function of engine demand sent to the coil generating a third magnetic field to

interact with the first magnetic field to move the pump member from the second position to the first position. Gladden, teaches away from the instant invention by disclosing a first signal generating a second magnetic field moving the pumping member from a first position to a second position and then generating a third magnetic field that interacts with the first magnetic field, however the third magnetic field also moves the pumping member from the first position to the second position not from the second position to the first position.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### ***Claim Numbering***

The claims have been renumbered as follows for allowance. The following table contains the original claim number with the new corresponding claim number.

Claims 1-37 have been canceled.

<i>OLD</i>	<b>NEW</b>	<b>OLD</b>	<b>NEW</b>	<b>OLD</b>	<b>NEW</b>	<b>OLD</b>	<b>NEW</b>
38	1	43	6	48	15	53	16
39	2	44	7	49	10	54	17
40	3	45	8	50	11	55	18
41	4	46	9	51	12	---	---
42	5	47	14	52	13	---	---

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Timothy P. Solak whose telephone number is 571 272-4833. The examiner can normally be reached on Monday through Friday from 9am to 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy S. Thorpe can be reached on 571 272-4444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
tps

April 29, 2005

  
Timothy S. Thorpe  
Supervisory Patent Examiner  
Group 3700

**Bombardier Recreational Products Inc.**

14 Place du Commerce – Suite 400  
Verdun, Quebec, Canada  
H3E 1T5  
T 514-732-7050  
F 514-732-7058  
www.brp.com

By Facsimile to 571-273-4833 (7 pages)

April 15, 2005

Commissioner for Patents  
P.O. Box 1450  
Arlington, VA 22313-1450

**RE: UNITED STATES PATENT APPLICATION**

**Serial No.:** 09/528,766  
**Title:** Reciprocating Fluid Pump Employing Reversing Polarity Motor  
**Inventor:** RADUE, Martin  
**Filing Date:** 3/17/2000  
**Examiner:** SOLAK, Timothy P.  
**Art Unit:** 3746  
**Confirmation #:** 5306  
**Our Ref.:** 200300679US1

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Sir:

Further to our telephone conversation with Examiner Solak on April 15, 2005,  
please amend the above-identified application as follows:



Serial No.: 09/528,766  
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**IN THE CLAIMS:**

ATTACHMENT D

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. – 37. (Canceled)

38. (Currently Amended) A fuel injection system, comprising:
- a fuel reservoir; and
  - at least one reciprocating fuel pump assembly in fluid communication with the fuel reservoir, each of the at least one reciprocating fuel pump assemblies comprising:
    - a housing assembly including a drive section and an adjacent pump section;
    - a drive assembly disposed in the drive section, the drive assembly including a permanent magnet having a first magnetic field and a coil assembly having a winding,
    - one of the magnet and the coil assembly being capable of reciprocal movement along an axis between a first position and a second position with respect to the other, the one forming, at least in part, a movable member,
    - ~~application to the winding of a first signal to the winding having a first polarity and a first amplitude generating a second magnetic field interacting with the first magnetic field to control causing~~ movement of the movable member between the first position and the second position,
    - ~~application to the winding of a second signal having a second polarity and a second amplitude generating a third magnetic field interacting with the first magnetic field to control movement of the movable member between the second position and the first position,~~
    - the first polarity being opposite to the second polarity;
    - a resilient member biasing the movable member in the first position; and
    - a pump assembly disposed in the pump section, the pump assembly including a pump member capable of reciprocal movement, the pump member

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operatively connected to the movable member, movement of the movable member causing movement of the pump member.

39. **(Currently Amended)** The fuel injection system of claim 38, further comprising:

a first fuel pump for drawing fuel from the fuel reservoir;  
a separator for receiving fuel from the first fuel pump; and  
a second fuel pump for drawing fuel from the separator,  
each of the at least one reciprocating fuel pump assembly receiving fuel from the second fuel pump.

40. **(Currently Amended)** The fuel injection system of claim 39, further comprising:

an inlet manifold receiving fuel from the second fuel pump, each of the at least one reciprocating fuel pump assembly drawing fuel from the inlet manifold; and

a return manifold for returning excess fuel from each of the at least one reciprocating fuel pump assembly to the separator.

41. **(Previously Presented)** The fuel injection system of claim 38, wherein the at least one reciprocating fuel pump assembly comprises a plurality of reciprocating fuel pump assemblies.

42. **(Previously Presented)** The fuel injection system of claim 38, further comprising an injection controller to control the operation of the at least one reciprocating fuel pump assembly.

43. **(Previously Presented)** The fuel injection system of claim 38, wherein the coil assembly surrounds the permanent magnet.

44. **(Previously Presented)** The fuel injection system of claim 38, wherein the movable member includes the coil assembly.

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45. **(Previously Presented)** The fuel injection system of claim 38, wherein the permanent magnet comprises two permanent magnets.

46. **(Currently Amended)** The fuel injection system of claim 38, wherein each of the at least one reciprocating fuel pump assembly further comprises a nozzle in fluid communication with the pump assembly for expressing pressurized fluid from the pump assembly.

47. **(Currently Amended)** An internal combustion engine, comprising:  
at least one combustion chamber; and  
a fuel injection system having a reciprocating fuel pump assembly associated with the combustion chamber to inject fuel therein,  
the reciprocating fuel pump assembly comprising:  
a housing assembly including a drive section and an adjacent pump section;  
a drive assembly disposed in the drive section, the drive assembly including a permanent magnet having a first magnetic field and a coil assembly having a winding,

one of the magnet and the coil assembly being capable of reciprocal movement along an axis between a first position and a second position with respect to the other, the one forming, at least in part, a movable member,

application to the winding of a first signal to the winding having a first polarity and a first amplitude generating a second magnetic field interacting with the first magnetic field to control causing movement of the movable member between the first position and the second position,

application to the winding of a second signal having a second polarity and a second amplitude generating a third magnetic field interacting with the first magnetic field to control movement of the movable member between the second position and the first position,

the first polarity being opposite to the second polarity;  
a resilient member biasing the movable member in the first position; and

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a pump assembly disposed in the pump section, the pump assembly including a pump member capable of reciprocal movement, the pump member operatively connected to the movable member, movement of the movable member causing movement of the pump member.

48. **(Previously Presented)** The internal combustion engine of claim 47, wherein the at least one combustion chamber comprises a plurality of combustion chambers, and

wherein the fuel injection system has a plurality of reciprocating fuel pump assemblies, each of the fuel pump assemblies being associated with a combustion chamber.

49. **(Previously Presented)** The fuel injection system of claim 38, wherein the movable member and the pump member move in the same direction.

50. **(Previously Presented)** The fuel injection system of claim 38, wherein the movable member contacts the pump member, forcing the pump member against the bias of the resilient member.

51. **(Previously Presented)** The fuel injection system of claim 38, further comprising:

a pump chamber formed in the pump section, the pump chamber having a side wall; and

a fluid inlet passage disposed in the side wall of the pump chamber.

52. **(Previously Presented)** The fuel injection system of claim 38, further comprising:

a fixed member formed at least in part by the other of the magnet and the coil assembly;

the movable member moving away from the fixed member when moving from the first position to the second position.

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53. **(Previously Presented)** The internal combustion engine of claim 47, wherein the movable member and the pump member move in the same direction.

54. **(Previously Presented)** The internal combustion engine of claim 47, further comprising:

a pump chamber formed in the pump section, the pump chamber having a side wall; and

a fluid inlet passage disposed in the side wall of the pump chamber.

55. **(Previously Presented)** The internal combustion engine of claim 47, further comprising:

a fixed member formed at least in part by the other of the magnet and the coil assembly;

the movable member moving away from the fixed member when moving from the first position to the second position.

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**REMARKS**

By this amendment, claims 38-40, 46, and 47 have been amended. No claims have been canceled. Claims 1-37 were canceled in a previous amendment.

Claims 38-55 are now pending in the application. Reconsideration and allowance of all of the claims are respectfully requested in view of the foregoing amendment and the following remarks.

Claims 38 and 47 have been amended as per our discussions with Examiner Solak. Claims 38 and 47 are believed to now be allowable.

Claims 39, 40, and 46 have been amended for consistency.

In view of the above amendments and remarks, the Applicant respectfully submits that claims 38-55 are now allowable and that the entire application is in condition for allowance.

Should the Examiner believe that anything further is desirable to place the application in better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,



Jonathan D. Cutler, Reg. No. 40,576

Attorney for the Applicant

Tel. (514) 732-7050

Fax (514) 732-7058



Bombardier Recreational Products Inc.

14 Place du Commerce  
Suite 400 - 4<sup>th</sup> Floor  
Verdun, Québec  
Canada H3E 1T5

www.brp.com

ATTACHMENT C

**Fax**

To	Timothy Solak	From	Jonathan Cutler
Title		Title	
Company	USPTO	Email	Jonathan.cutler@brp.com
Fax	571.273.4833	Fax	514.732.7058
Phone	571.272.4833	Phone	514.732.7050

Date  
April 14, 2005  
Number of page including this one  
3

RE: US Application 09/528,766

Examiner Solak,

Following our discussion yesterday, we have amended claim 38 further. We have added that the signals have an amplitude. We believe this change to be along the lines of what you had previously suggested in a prior interview with Mr. Ziolkowski (see attached document).

I will be available on Friday to discuss.

Confidentiality Notice: These documents sent by facsimile are confidential, may be privileged and are intended for the exclusive use of the addressee. Any other person is strictly prohibited from disclosing, distributing or reproducing them. If the addressee cannot be reached or is unknown to you, please inform us by telephone at the above-mentioned number, at our expense, and return these documents by mail to the above-mentioned address.

Sk-Doo  
Lynx  
Sea-Doo  
Evinrude  
Johnson  
Rotax  
Bombardier ATV

38. **(Currently Amended)** A fuel injection system, comprising:
- a fuel reservoir; and
  - at least one reciprocating fuel pump assembly in fluid communication with the fuel reservoir, each of the at least one reciprocating fuel pump assemblies comprising:
    - a housing assembly including a drive section and an adjacent pump section;
    - a drive assembly disposed in the drive section, ~~the drive assembly and~~ including a permanent magnet having a first magnetic field and a coil assembly having a winding,
      - one of the magnet and the coil assembly being capable of reciprocal movement along an axis between a first position and a second position with respect to the other, the one forming, at least in part, a movable member,
      - application to the winding of a first signal to the winding having a first polarity and a first amplitude generating a second magnetic field interacting with the first magnetic field to control causing movement of the movable member between the first position and the second position,
      - application to the winding of a second signal having a second polarity and a second amplitude generating a third magnetic field interacting with the first magnetic field to control movement of the movable member between the second position and the first position,
      - the first polarity being opposite to the second polarity;
    - a resilient member biasing the movable member in the first position; and
    - a pump assembly disposed in the pump section, the pump assembly including a pump member capable of reciprocal movement, the pump member operatively connected to the movable member, movement of the movable member causing movement of the pump member.



Continuation Sheet (PTOL-413B)

Application No. 09/528,766

Continuation of Substance of Interview including description of the general nature of what was discussed:

I informed Timothy Ziolkowski that I had discussed the case with my supervisor. I informed Timothy Ziolkowski, that a new reference Tsukahara (5,064,353) taught a moving coil that was controlled by alternating polarity signals; however the coil was controlled by frequency unless an overpressure condition changed the magnitude of the signal. Gully on the other hand taught the amplitude control of a coil that was stationary.

→ I suggested adding language such as: the amplitude of the signal controlled the force on the coil to cause the coil to move, as a possible solution. Timothy Ziolkowski questioned what the added limitation would do for the claim. I informed Timothy Ziolkowski that such language would bring out the amplitude signal moving the coil.

Timothy Ziolkowski stated that making the changes would be agreeing to the obviousness of the combination of Waring with Gully. Timothy Ziolkowski stressed there was no reason, other than applicants disclosure, to use Waring.

Timothy Ziolkowski again attacked the combination of Waring with Gully; but more specifically that the Waring reference did not teach the instant invention. Timothy Ziolkowski stressed his opinion, that there were no teachings or suggestions to separate the two-pump structure taught by Waring and that doing so would not produce a variable flow. Timothy Ziolkowski stressed that the variable flow disclosed by Waring came from a combination of the two pumps and that a single pump would not produce a variable flow.

I informed Timothy Ziolkowski that the division or unity of a part did not patentable define a structure and that one of ordinary skill would quickly realize that half of Waring could be used as a pump. Further I question Timothy Ziolkowski on the add emphasis to variable flow; citing the lack of a variable flow limitation in Claim 1.

Timothy Ziolkowski cited line 9, of Claim 1, "to produce pressure variations in the pump section" as a variable flow limitation. I informed Timothy Ziolkowski that Waring taught pressure variations in the pump section, namely within the cylinder. Further I informed Timothy Ziolkowski that any piston pump is going to develop pressure variations in the piston's cylinder. Moreover I informed Timothy Ziolkowski that the variations were caused by a force to draw fuel into the pump section and discharged fuel therefrom. I stressed there was no reason to assume the variations were outside of the pump because the claim defined the pump section as only, not being the motor section.

A discussion on the pressure variations followed. I questioned Timothy Ziolkowski as to whether the pressure variations were in relation to a change in volume similar to an injector, such that the change in amplitude resulted in a change in volume. Timothy Ziolkowski agreed the invention related to injectors.

I informed Timothy Ziolkowski that the claimed invention was a solenoid pump with a moving coil, which was well known in the art. I stated to Timothy Ziolkowski that operating a solenoid pump with a current was also pretty well known. Timothy Ziolkowski stressed a permanent magnet in a solenoid pump as a defining feature. I informed Timothy Ziolkowski that Waring taught a permanent magnet in a solenoid pump.

Timothy Ziolkowski and I agreed to think the matter over and continue our discussion later.

On 10/27/2003, Timothy Ziolkowski suggested some possible changes in the Claim language. [The changes expressed are reflected in the amendment received on 10/28/2003.]

I informed Timothy Ziolkowski that I would review the changes and contact him later.

On 10/28/2003, I informed Timothy Ziolkowski that the proposed changes to Claim 8 were moving in the right direction, namely connecting the pressure output to the amplitude of the signal. However I informed Timothy Ziolkowski, that in order to allow Claim 8, it would have to be limited to a moving coil because Gully taught a moving magnet controlled by changes in the amplitude of a signal. Further I informed Timothy Ziolkowski that the scope of the claims were changing from a pump with a moving coil to a control system for a pump.

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a pump assembly disposed in the pump section, the pump assembly including a pump member capable of reciprocal movement, the pump member operatively connected to the movable member, movement of the movable member causing movement of the pump member.

39. **(Currently Amended)** The fuel injection system of claim 38, further comprising:

a first fuel pump for drawing fuel from the fuel reservoir;  
a separator for receiving fuel from the first fuel pump; and  
a second fuel pump for drawing fuel from the separator,  
each of the at least one reciprocating fuel pump ~~assembly~~assemblies receiving fuel from the second fuel pump.

40. **(Currently Amended)** The fuel injection system of claim 39, further comprising:

an inlet manifold receiving fuel from the second fuel pump, each of the at least one reciprocating fuel pump ~~assembly~~assemblies drawing fuel from the inlet manifold;  
and

a return manifold for returning excess fuel from each of the at least one reciprocating fuel pump ~~assembly~~assemblies to the separator.

41. **(Previously Presented)** The fuel injection system of claim 38, wherein the at least one reciprocating fuel pump assembly comprises a plurality of reciprocating fuel pump assemblies.

42. **(Previously Presented)** The fuel injection system of claim 38, further comprising an injection controller to control the operation of the at least one reciprocating fuel pump assembly.

43. **(Previously Presented)** The fuel injection system of claim 38, wherein the coil assembly surrounds the permanent magnet.

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**IN THE CLAIMS:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. - 37. (Canceled)

38. (Currently Amended) A fuel injection system for an internal combustion engine, comprising:

a fuel reservoir; and

at least one reciprocating fuel pump assembly in fluid communication with the fuel reservoir, each of the at least one reciprocating fuel pump assemblies comprising:

a housing assembly including a drive section and an adjacent pump section;

a drive assembly disposed in the drive section, the drive assembly including a permanent magnet having a first magnetic field and a coil assembly having a winding,

one of the magnet and the coil assembly being capable of reciprocal movement along an axis between a first position and a second position with respect to the other, the one forming, at least in part, a movable member,

application to the winding of a first signal to the winding having a first polarity and a first amplitude generating a second magnetic field interacting with the first magnetic field to control causing movement of the movable member between the first position and the second position,

application to the winding of a second signal having a second polarity and a second amplitude generating a third magnetic field interacting with the first magnetic field to control movement of the movable member between the second position and the first position,

the first polarity being opposite to the second polarity,

the first and second signals being independently alterable as a function of engine demand;

a resilient member biasing the movable member in the first position; and

OK TO  
ENTER  
1/23/06



Bombardier Recreational Products Inc.

14 Place du Commerce – Suite 400  
Verdun, Quebec, Canada  
H3E 1T5  
T 514-732-7050  
F 514-732-7058  
www.brp.com

By Facsimile to 571-273-4833 (7 pages)

April 20, 2005

Commissioner for Patents  
P.O. Box 1450  
Arlington, VA 22313-1450

**RE: UNITED STATES PATENT APPLICATION**

**Serial No.:** 09/528,766  
**Title:** Reciprocating Fluid Pump Employing Reversing Polarity Motor  
**Inventor:** RADUE, Martin  
**Filing Date:** 3/17/2000  
**Examiner:** SOLAK, Timothy P.  
**Art Unit:** 3746  
**Confirmation #:** 5306  
**Our Ref.:** 200300679US1

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Sir:

Further to our telephone conversation with Examiner Solak on April 20, 2005,  
please amend the above-identified application as follows:

09/528 766

From J. C. Her

514-732-7056

38. (Previously Presented) A fuel injection system, comprising:
- a fuel reservoir; and
  - at least one reciprocating fuel pump assembly in fluid communication with the fuel reservoir, each of the at least one reciprocating fuel pump assemblies comprising:
    - a housing assembly including a drive section and an adjacent pump section;
    - a drive assembly disposed in the drive section, the drive assembly including a permanent magnet having a first magnetic field and a coil assembly having a winding, one of the magnet and the coil assembly being capable of reciprocal movement along an axis between a first position and a second position with respect to the other, the one forming, at least in part, a movable member, application to the winding of a first signal having a first polarity generating a second magnetic field which, via interaction with the first magnetic field, causes movement of the movable member between the first position and the second position, and application to the winding of a second signal having a second polarity generating a third magnetic field which, via interaction with the first magnetic field, affects movement of the movable member between the second position and the first position;
    - a resilient member biasing the movable member in the first position; and
    - a pump assembly disposed in the pump section, the pump assembly including a pump member capable of reciprocal movement, the pump member operatively connected to the movable member, movement of the movable member causing movement of the pump member.

Attachment A

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44. **(Previously Presented)** The fuel injection system of claim 38, wherein the movable member includes the coil assembly.

45. **(Previously Presented)** The fuel injection system of claim 38, wherein the permanent magnet comprises two permanent magnets.

46. **(Currently Amended)** The fuel injection system of claim 38, wherein each of the at least one reciprocating fuel pump assembly further comprises a nozzle in fluid communication with the pump assembly for expressing pressurized fluid from the pump assembly.

47. **(Currently Amended)** An internal combustion engine, comprising:  
at least one combustion chamber; and  
a fuel injection system having a reciprocating fuel pump assembly associated with the combustion chamber to inject fuel therein,  
the reciprocating fuel pump assembly comprising:  
a housing assembly including a drive section and an adjacent pump section;  
a drive assembly disposed in the drive section, the drive assembly including a permanent magnet having a first magnetic field and a coil assembly having a winding,

one of the magnet and the coil assembly being capable of reciprocal movement along an axis between a first position and a second position with respect to the other, the one forming, at least in part, a movable member,

application to the winding of a first signal to the winding having a first polarity and a first amplitude generating a second magnetic field interacting with the first magnetic field to control causing movement of the movable member between the first position and the second position,

application to the winding of a second signal having a second polarity and a second amplitude generating a third magnetic field interacting with the first magnetic field to control movement of the movable member between the second position and the first position,

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the first polarity being opposite to the second polarity,

the first and second signals being independently alterable as a function of engine demand;

a resilient member biasing the movable member in the first position; and

a pump assembly disposed in the pump section, the pump assembly including a pump member capable of reciprocal movement, the pump member operatively connected to the movable member, movement of the movable member causing movement of the pump member.

48. **(Previously Presented)** The internal combustion engine of claim 47, wherein the at least one combustion chamber comprises a plurality of combustion chambers, and

wherein the fuel injection system has a plurality of reciprocating fuel pump assemblies, each of the fuel pump assemblies being associated with a combustion chamber.

49. **(Previously Presented)** The fuel injection system of claim 38, wherein the movable member and the pump member move in the same direction.

50. **(Previously Presented)** The fuel injection system of claim 38, wherein the movable member contacts the pump member, forcing the pump member against the bias of the resilient member.

51. **(Previously Presented)** The fuel injection system of claim 38, further comprising:

a pump chamber formed in the pump section, the pump chamber having a side wall; and

a fluid inlet passage disposed in the side wall of the pump chamber.

52. **(Previously Presented)** The fuel injection system of claim 38, further comprising:

a fixed member formed at least in part by the other of the magnet and the coil assembly;

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the movable member moving away from the fixed member when moving from the first position to the second position.

53. **(Previously Presented)** The internal combustion engine of claim 47, wherein the movable member and the pump member move in the same direction.

54. **(Previously Presented)** The internal combustion engine of claim 47, further comprising:

a pump chamber formed in the pump section; the pump chamber having a side wall; and

a fluid inlet passage disposed in the side wall of the pump chamber.

55. **(Previously Presented)** The internal combustion engine of claim 47, further comprising:

a fixed member formed at least in part by the other of the magnet and the coil assembly;

the movable member moving away from the fixed member when moving from the first position to the second position.



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**REMARKS**

By this amendment, claims 38-40, 46, and 47 have been amended. No claims have been canceled. Claims 1-37 were canceled in a previous amendment.

Claims 38-55 are now pending in the application. Reconsideration and allowance of all of the claims are respectfully requested in view of the foregoing amendment and the following remarks.

Claims 38 and 47 have been amended as per our discussions with Examiner Solak. Claims 38 and 47 are believed to now be allowable.

Claims 39, 40, and 46 have been amended for consistency.

In view of the above amendments and remarks, the Applicant respectfully submits that claims 38-55 are now allowable and that the entire application is in condition for allowance.

Should the Examiner believe that anything further is desirable to place the application in better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,



Jonathan D. Cutler, Reg. No. 40,576  
Attorney for the Applicant  
Tel. (514) 732-7050  
Fax (514) 732-7058



Bombardier Recreational Products Inc.

14 Place du Commerce  
Suite 400 - 4<sup>th</sup> Floor  
Verdun, Québec  
Canada H3E 1T5  
[www.brp.com](http://www.brp.com)

ATTACHMENT B

**Fax**

	To <b>Timothy Solak</b>	From <b>Jonathan Cutler</b>
	Title	Title
	Company <b>USPTO</b>	Email <b>Jonathan.cutler@brp.com</b>
Date <b>April 12, 2005</b>	Fax <b>571.273.4833</b>	Fax <b>514.732.7058</b>
Number of page including this one <b>56</b>	Phone <b>571.272.4833</b>	Phone <b>514.732.7050</b>

**RE: US application 09/528,766**

Examiner Solak,

Further to our telephone conversation of April 11, 2005, please find enclosed a draft copy of the IDS we intend to submit in the present application.

The documents cited in the IDS are the result of a patent search we did in Japan. For simplicity, the present transmission only includes the English abstracts and the figures of the Japanese documents. The filing of the actual IDS will include copies of all the documents listed thereon. Should you want the machine translation of a specific JP document and/or the document itself prior to discussing the case with us, do not hesitate to contact us and we will forward you a copy.

Also enclosed is a draft copy of a second IDS we intend to submit in the present application. We believe the documents listed on this second IDS to be cumulative of other documents already cited in the case. The filing of the actual IDS will include copies of all the documents listed thereon.

Should you have any questions, do not hesitate to contact us.

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